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NAVAL WAR COLLEGE

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SYNCHRONIZATION OF LITTORAL OPERATIONS

by

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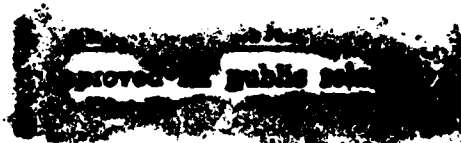


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The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

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INTRODUCTION AND STATEMENT OF THESIS

This paper attempts to examine selected major historical littoral operations in order to examine the synchronization factors that might be applied to future operations. Special emphasis is placed on amphibious landings. Synchronization can be defined as the arrangement of land, air, and sea forces in time, space, and purpose to produce results whose sum is greater than the sum of the individual capabilities.¹ The thesis of this paper is that synchronization has historically constituted a major factor in amphibious operations and despite improvements in technology as evidenced by platforms such as Landing Craft Air Cushion (LCACs), synchronization will continue to be a major consideration. It can be a deciding factor, as it has been in the case studies examined.

The following historical cases were studied with particular emphasis on synchronization: Gallipoli in 1914/15; Norwegian Landing in 1940; Normandy in 1944; and the Falklands in 1982.

GALLIPOLI PENINSULA/DARDANELLES

The Gallipoli campaign was characterized by poor synchronization. It was also planned and executed poorly in terms of joint warfare. A joint staff (Army, Navy) was never formed to study the operation. The commander-in-chief of the fleet, Admiral John R. Jellicoe, was opposed to the operation, but he was never consulted.² The operation appears to have been a result of the enthusiasm of Churchill (Secretary of Navy) and Kitchener (Secretary of the Army) who had briefed the War Council. The concept of attacking the Dardanelles appealed to Kitchener because it would, if successful, relieve the stalemated western front.

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It would also free up SLOCs with the Russians. Although Kitchener supported the concept Kitchener in principle, he was unwilling to support the operation with any Army personnel.

Churchill was convinced that the Royal Fleet could seize control of the straits. The operation initially began in November 1914 with naval bombardments that were indecisive and did nothing but destroy any element of surprise for the future. As a result of these bombardments, Germany assisted the Turks in reinforcing the straits during the month of December 1914; the Germans added searchlights, mines and eight 6-inch howitzer batteries that were capable of being moved by personnel so as to avoid naval bombardments. At the Narrows (a point 14 miles upstream where the straits decrease in width to 1600 yards) the Turks reinforced two ancient fortresses with 72 guns, torpedo tubes, mines, and an underwater wire mesh to block submarines. Heavy guns at Kum Kale near the mouth of the straits and at Sedd-el-Bahr were also positioned; the total number of guns along the straits numbered 100 upon completion of these reinforcements. ⁴

The physical characteristics of the straits played a dominant role in planning and execution. It is important to note that there is no point in the entire 40 miles of straits in which a ship couldn't be reached by hostile fire from either shore, both shores being controlled by the enemy. The terrain adjacent to the straits is extremely mountainous, enabling the enemy troops positioned on mountain peaks to observe the location of all ships. The Allies, on the other hand, could not determine the positions of Turkish gun emplacements. The hydrography was not extremely challenging for the naval forces: the tidal range

was negligible, depth of water was not a problem, but there was a 5 knot current generated by Black Sea rivers and melting snow. Another limiting feature for the Allies, especially later on in the campaign, was that there were only 4 beaches on the Western side of the straits suitable for an amphibious landing: Bulair, Suvla Bay, Ari Burnu, and Cape Helles. There were some beaches on the eastern side of the straits but the Turkish guns in Asia Minor would easily overpower such a landing force.

Despite the inconclusive results achieved in the November 1914 naval bombardments, Churchill continued to insist on the ability of the Navy to take Constantinople without participation by the Army. The engagement was unusual in that this Allied Naval Expeditionary Force did not combat another navy but rather the German and Turkish artillery forces. The Allies did have some factors in their favor, despite the lost element of surprise. The 12 inch guns aboard the battleships and the 15 inch guns of the *Queen Elizabeth* had a longer range than the Turkish shore batteries, enabling the Allies to fire on the mouth of the straits before coming into range of the enemy gunfire. With this in mind, the Allies planned the operation in three phases: 1) deliberate long-range bombardment; 2) medium-range bombardment; and 3) overwhelming fire at close range.

Thus on 19 February 1915 the British and French fleets attacked the straits. The first phase, deliberate long-range bombardment, went according to plan, lasting for approximately 4 hours. Problems developed after phase 1, some of which were related to synchronization. One such problem was that the naval bombardments which had to be conducted during the hours of daylight in order to

sight targets. This allowed the Turks to lay mines at night where Allies had been operating earlier that day. As a result, the Allies experienced several mine casualties in areas that had been previously swept. Another synchronization problem was that the unarmed minesweepers, which were manned by civilian crews, had to take stations ahead of the battleships when conducting minesweeping operations. The civilian crews repeatedly fled when confronted with enemy fire, insisting that they had signed up only for the risks associated with disposing of mines and not the risks associated with enemy fire. As a result, the British had to train military personnel how to man the minesweepers, but the crews were so inexperienced that minesweeping was never effective. By 13 March 1915, the Allied Task Force Commander, Admiral Carden stepped down from command due to a nervous breakdown.

Carden's replacement, Admiral de Robeck, was under significant pressure from Churchill to continue offensive operations despite the difficulties. Churchill was convinced that the Turks and Germans were running out of ammunition and were about to collapse. As a result, a major offensive was launched on 18 March 1915 in which the French lost the *Bouvet*, the British lost *Ocean* and *Irresistible*, and two ships, *Gaulois* and *Inflexible* had to be towed away for major repairs. As a result, on 22 March 1914, Admiral de Robeck decided that he needed assistance from the British Army in order to win.

Not only was the 18 March battle an operational victory for the Turks, but it fueled Moslem unity. This unity contributed to the religious fervor that resulted in the massacre of approximately 750,000 Armenians. The Germans, although Christians, stood by and watched, realizing that the massacre would

create Turkish nationalism that would enhance Turkey's strength as an ally.⁵ Having held off one of the greatest navies in the world, the Turks and Germans had gained a significant moral victory.

General Ian Hamilton, the British Army officer, had the job of assembling 75,000 Army personnel who were scattered all over Europe, as well as planning the logistics support. Poor packing of the supply ships, which had arrived at Lemnos (the staging area) necessitated a trip to Alexandria to repack the ships because Lemnos didn't have the appropriate cargo handling facilities. These delays enabled the Germans to reinforce the straits with another division of personnel plus ammunition, food and other critical supplies. The fact that the Allies were going to attempt a landing (as opposed to continuing with naval bombardments alone) was of no surprise to the Axis nations due to poor OPSEC. The *Egyptian Gazette* in Cairo published the arrival of the Army at Lemnos and even discussed the probability of success of the Dardanelles expedition.⁶

The technology available in 1915 should be kept in mind, as well as the fact that this theater of operations was of secondary importance. Aircraft were not made available for this campaign, since it was not the primary theater. Even had the aircraft been made available, they would have been primarily for reconnaissance. Shrapnel-proof landing craft, although available at the time, were not dedicated to this operation.⁷

The landing operation was to be one of dispersal rather than concentration. The goal was to enable all landing forces to establish themselves before the Germans could decide where to reinforce. In order to achieve some type of surprise, the Allies planned two major diversions: 1) the Royal Navy was to feint a landing at

Bulair; and 2) the French were to go ashore and raid Kum Kale (on the Asian side of the straits). After creating the diversionary effect, these forces were return to supplement the main attack.

Without going into the tactical details, the execution of the plan had limited success, e.g. the French successfully raided Kum Kale and rejoined the main forces. The forces that actually made it ashore were unable to conduct offensive operations to unite with other Allied forces. Each found itself pitted against a well-established enemy with superior terrain and cut off from logistical support. The situation degenerated into trench warfare resembling that of the western front. The operation had failed.

The case presents a clear illustration of the problems presented by poor synchronization. The fact that the campaign was done so deliberately and sequentially, plagued by delays and indecision, resulted in its failure. The lack of sufficient force at decisive points gave the enemy not only the opportunity to survive the attacks and reestablish command and control, but just as importantly, the moral confidence to sustain future attacks. Operational Deception (OPDEC) was attempted too late in the campaign, and Operational Security (OPSEC) was appalling. Had the Allies initially conducted a joint, synchronized attack on the Dardanelles, the evidence clearly indicates that the operation would have been successful. The synergistic effects of naval and ground forces, coupled with surprise, would have thrown the Turks into confusion, allowing the Allies to gain enough of a foothold to establish logistical lines of communication. Once having gained control over the strategic territory at the mouth of the straits, the Allies could have begun a more sequential land

campaign. Despite its failure, much had been learned, and many of these lessons were remembered in future operations. "Everything in their [the Allies'] three months' experience in Gallipoli had made it plain to Hamilton's Headquarters that once the period of surprise was gone there was very little chance of breaking the enemy line. Every hour, even every minute, counted." 8

THE NORWAY INVASION IN 1940

The second case study examined is Operation *Weserubung*, the invasion of Norway by the Germans in April 1940. Following is a succinct comparison with the first case study: "From the German viewpoint the Norwegian campaign was an exhibition of excellent planning and coordination of a combined air, land, and sea operation in which "fifth-column" activities played a major part. From the Allied viewpoint it may be regarded as the Gallipoli of World War II." 9

It is unfair in certain respects to give the Germans too much credit for Norway. After all, Norway was essentially neutral prior to the invasion, despite the Russian invasion of Finland. Norway and Germany were economically linked via the iron ore trade that passed from Sweden through the ports of Norway to Germany.

Nor should the achievements be underestimated. The British posed a significant threat to the concept of operations, and had drawn up similar plans for occupying Norway, so the British were intimately familiar with the environment, terrain, hydrography, etc. The Norwegians would have put up a much more serious fight had the Germans attempted the operation in a piecemeal, unsynchronized fashion.

Physical characteristics were major planning considerations. The Norwegian terrain is extremely mountainous, so that ground lines of communication consisted of valleys formed by rivers. At the time, approximately 85% of the population and almost 100% of industrial areas were situated in the southern cities of Oslo and Trondheim and in the valley that connects the two.¹⁰ All of the principal coastal cities were defended by ancient seacoast garrisons. No mines had been placed, although one day prior to the invasion, the Allies announced that they were going to mine Norway's territorial waters because of the iron ore being transported through these waters.

Environmental factors were also critical. The Germans sought to transit through the Norwegian territorial waters during low visibility, storms, and long nights in order to reach the distant port of Narvik without detection.¹¹ Furthermore, ice was still present in many of the waters. Several feet of snow presented a significant obstacle for the Germans once having landed.

The planning of this campaign dated back as far as 1931 when Major Vidkun Quisling, the Nazi party leader in Norway, became the Minister of Defense. He made frequent visits to Germany and met with Hitler a few days before landing.¹² During the year preceding the invasion, Quisling coordinated the efforts of German "sleeper agents" posing as tourists and businessmen.

Although Hitler desired that an Army officer be designated as the unified commander of all land, air, and naval forces, the navy and air force expressed strong objections to subordinating their personnel to any army officer. Therefore, Hitler retained overall control personally. Army General Falkenhorst, a mountain warfare specialist, was designated as the senior

commander, but had no direct authority over the air or naval forces.¹³ The general plan involved the near-simultaneous landings at 6 Norwegian ports from as far north as Narvik to the southern city of Oslo. Five of the six landings were to be naval; the last (Stavenger) was to be conducted by airborne personnel. The operation demanded more ships than the German navy could muster, so Hitler covertly sent part of the expeditionary force in commercial ships as cargo. These ships were scheduled to arrive in Norwegian ports approximately 1 week ahead of the warships. This deception technique worked extremely effectively, since German ships, carrying iron ore and coal, routinely operated within the territorial waters of Norway in order to escape the Royal Navy. In fact, Norwegian pilots even navigated the ships through the Norwegian fjords, unaware of the German troops stowed below deck.¹⁴

The execution of the plan went essentially according to plan. General Von Falkenhurst's staff took over a hotel in Oslo shortly after the invasion and quickly established radio contact with the 5 other areas. The Norwegians were totally caught off guard by the lightning speed at which all of the strategic areas of Norway were invaded. Little resistance was offered by the disoriented and demoralized Norwegian forces. Just as importantly, the Royal Navy had been caught off guard; there were even British troop transport ships in the vicinity ready to enact their own invasion plan. The Brits had been deceived into believing that the German Navy was heading toward the North Atlantic and then west. By the time the British reacted, it was too late; the Germans had already completed amphibious landings and established local control of the sea, air and land.

Logistics and sustainment followed the landing quickly. Mobile artillery and supply trains (both motorized and horse-drawn) carried ammunition and food to German troops, sometimes through snow 6 feet in depth. In addition to the landings on the Norwegian coast, Germany simultaneously conducted an unopposed invasion of Denmark, which was essentially a land campaign launched through Sleswig-Holstein. The use of Denmark's air bases and ports nicely complemented the invasion of Norway.

Besides its involvement in providing the transport aircraft for the airdrop into Stavenger, the German Air Force kept the Royal Navy's carriers away from the Norwegian coast. The 10th Air Corps at Hamburg supported the attacks on Norway and Denmark with 1,212 aircraft, the majority of which were transports. Roughly one hundred fighters and four hundred long range bombers were dedicated to the operation.¹⁵

The operation, although obscured by bloodier and possibly more strategically important operations during WWII, serves as the first true synchronized major operation involving air, land, and naval forces. The cooperative joint environment during the planning and execution phases was largely responsible. The results were spectacular in terms of meeting the strategic goals, minimizing casualties, and synchronizing of resources.

THE ALLIED INVASION OF NORMANDY (OVERLORD)

Overlord serves as a case study not only in joint littoral operations, but multinational littoral operations. Under the command of Supreme Allied Commander General Eisenhower, Overlord represents a task of enormous

complexity in which synchronization was critical. The timing of the landing with respect to tides, weather, lunar phases, and other factors and their impacts on reconnaissance, fire support, landings, logistical support, buildup and commencement of the land operations represented the key to achieving a sufficient amount of surprise to spell success.

Synchronization for an operation of this size involved considerations unique to larger landings. For example, due to the limited number of landing craft, ships would have to shuttle back and forth to pick up troops. Another complication was sheer size limitations of beachheads. General Montgomery pressed for a wide assault area (forty miles wide) in order to avoid confusion in supply and administration. It would also provide more avenues of egress for vehicles and thus facilitate inland movement. Major General West, the G-3, favored a narrower assault area (twenty-five miles wide) so as to concentrate force. It would also reduce the preparatory phase (recon, minesweeping, shore bombardments). In the end, the entire front was over sixty miles long.¹⁶

Another important consideration regarding the timing of Overlord was the weather of the subsequent land battle. Whereas Gallipoli and Norway were per se strategic successes (i.e. the seizures of the land adjacent to the littoral was the objective), Overlord was an enabling force. Consequently, synchronization of the littoral and the subsequent land campaign were interrelated. Furthermore, events in other theaters had to be considered. Competing operations, such as Anvil, had to be factored in, especially in planning the landing craft requirements.

Tides were a consideration. Since the Germans had constructed obstacles in

areas normally covered at high tide, the landing was planned for low tide so that these obstacles could be avoided. The naval approach was chosen to occur at sunset, and the airborne assaults on moonlit nights where possible.

Postponing the operation due to inclement weather was another critical consideration, given the massive numbers of troops and ships involved. Delays would jeopardize operational security, reduce morale, disrupt all timetables, diminish the duration of good weather land campaigning, and increase awareness of the enemy.¹⁷ Eisenhower describes delays as "suspended animation involving more than 2,000,000 men".¹⁸

Operational Deception was an interesting aspect of Overlord. The Allies had conducted a reconnaissance mission on the French port of Dieppe in northern France involving 6,000 Canadian troops on 19 August 1942. The purpose of the raid was to gain insight as to difficulties that needed to be considered for the actual Overlord mission. Only 2,500 of the 6,000 troops survived¹⁹, and Hitler believed that he had deterred a full-scale invasion. Meanwhile, the northern coast of France was being fortified into what would be called the Atlantic Wall.

By November 1943, the situation did not appear the way Hitler had envisioned. The Allies had regained self-confidence tactically and operationally. The Atlantic Wall was not yet complete, and Hitler ordered an acceleration of the coastal defenses under the direction of Rommel. General Rommel recognized the importance of identification of the landing site as soon as possible and spread out his divisions to provide a minimum defensive posture all along the coast, with reserves held in the rear to reinforce the attacked sector.

Therefore, during the summer of 1944, the Allies were up against a coast well-defended by a determined enemy. The two variables that Eisenhower's staff could somewhat control were 'where' and 'when'. For the 'where' portion, the Allies sought to persuade the enemy that the landing would take place in the Pas de Calais, where the channel is the narrowest and the beaches sandy and level. The OPDEC plans included false radio transmissions, fictitious commands, the appointment of Patton to command such an assault (Patton being well-known among Germans) and preparatory bombardments in the Calais area prior to the actual landings at Normandy.

Another major factor in favor of the Allied invasion was control of the sea and air in the littoral area. Furthermore, the German forces were dispersed along the coast due to the uncertainty as to the exact location of the assault. However, the Germans were well known for their rapid reaction capability which was demonstrated at Salerno. The Allies' ability to buildup the beachhead would require air strikes against the French infrastructure (roads, bridges), which had the disadvantage of rendering it useless for the Allies for the subsequent land invasion.

In addition to the cooperative interservice, allied environment fostered by the Combined Joint Chiefs of Staff, Overlord planners did something simple yet effective. Meetings were conducted in St. Paul's School in London; in attendance were senior officials like Eisenhower and Churchill, and operational level commanders. These meetings "served to bring to the attention of all commanders the broad purposes of the highest headquarters and to give to each a fully completed and rounded picture of the support he could expect."²⁰ This

paid dividends with respect to synchronization by enabling more decentralized command authority since the concept of operations was intimately understood by such a large number of leaders. The potential disadvantage was the loss of OPSEC.

THE BATTLE OF THE FALKLANDS 1982

The amphibious landings conducted in April 1982 at the Falkland Islands by the British were preceded by reconnaissance teams deployed by helicopter and inflatable boats (the latter from 'O' class patrol submarines suitable for special operations). The insertion of patrols via high-altitude, low-opening parachute drop was deemed too dangerous.²¹ The helicopters flew in total darkness using passive night goggles in early May. The reconnaissance teams were able to obtain virtually no intelligence of value from the Falklands population, contrary to popular mythology.²² However, they were able to observe Argentinian personnel and their defensive fortifications. Luckily, none of the special forces personnel were discovered by the Argentinians.

Meanwhile, another synchronization-related task was being accomplished on Ascension Island: massive quantities of ammunition and equipment, which had been hastily loaded on the ships in England, were being shuffled by helicopter between ships to put it into combat loading disposition. (This lesson should have been learned at Gallipoli).

The selection of the amphibious assault location impacted synchronization. An assault on Berkeley Sound, close to Port Stanley, if successful, would facilitate a relatively short subsequent land operation. On the other hand, this

site would require extremely well-coordinated operations due to the defensive capabilities of the Argentinians. Such an assault would depend on helicopters to secure the hills overlooking the beach. Weather was such an unpredictable element that the helicopter flying was undependable.

San Carlos Bay, on the other hand, was far from Port Stanley, so even a successful amphibious landing would not spell success as far as taking Port Stanley. Furthermore, the beaches were confined for a large landing. T S reported that no enemy troops were present at San Carlos and found no evidence of mines. In the end, San Carlos Bay was decided upon.

During the journey from Ascension Island to the Falklands, one more synchronization problem arose. All of the marines who were to land at San Carlos were on the *Canberra*, a 44,807 ton P&O commercial liner temporarily leased by the Brits. In order to disperse the marines to reduce the probability of the entire brigade being lost, the decision was made to move part of the landing force to several ships. Unable to pull into a port, and with helicopters being so precious, over 1,000 troops were transferred by landing craft to other ships in heavy seas.²³ This oversight could have been corrected easily at Ascension and jeopardized the synchronization plans.

Another major consideration was air control. The land-based Argentinian aircraft based on Pebble Island, north of West Falkland, posed a significant synchronization problem for the British. The Harriers, in quantity and quality, were incapable of conducting simultaneously CAP and shore bombardment missions in support of the amphibious landing. The British handled this by preemptively destroying the aircraft on the ground at Pebble Island with SAS

forces, destroying eleven aircraft by means of explosive charges. Had this mission failed, the landing at San Carlos would have required sophisticated coordination and synchronization of Harriers and naval gunfire support. Although enemy aircraft based in Rio Gallego in southern Argentina (350 miles to the west) still played a major role, the distance prevented the Argentinians from attacking the British at decisive times, such as during the amphibious landing.

Despite the overall victory, the British learned some new lessons and relearned some old ones such as cargo loading. The Falklands gave new life to the British marines/commandos and illustrated the continued importance of naval gunfire support. Unlike Gallipoli, the operation was well-synchronized for the most part.

GENERAL CONCLUSIONS FROM THE CASE STUDIES

The purpose of the case studies was to determine any lessons learned that might be applicable in synchronizing future operations in the littoral. The case studies examined illustrate that successful operations were well-synchronized; the one unsuccessful operation studied (Gallipoli) was poorly synchronized. Although synchronization of land operations is often very important, the case studies demonstrate that synchronization of operations against defended littorals will always be important. Some of the reasons follow:

- In amphibious attacks, cover and concealment are typically nonexistent for the attacking force; the terrain will almost always favor the defender, and the weather will at best be neutral.

- During the early phases of amphibious operations, it is frequently unfeasible for the attacker to transition from offense to defense because of the tenuous position. This means that a sequential acquisition of land is nearly impossible (either you hold the beach or you lose it) and withdrawal is frequently impossible. Of the DRAW-D options, the attacker has, in general, only one: attack. The enemy, on the other hand, can employ any of the five options (defend, reinforce, attack, withdraw, or delay).

- Familiarity with the terrain is an advantage of the defender. Not only does he know the natural obstacles (vegetation, hills, swamps, etc.) but he knows the man-made ones as well (mines, booby-traps, razor wire, etc.)

- Sustainment generally favors the defender. The attacker will typically rely on sea lines of communication and/or air lines of communication. Combat loading of ships is critical. The defender, on the other hand, will typically have at his disposition ground lines of communication that are tied to central, well-established depots.

- Given that surprise will often be essential, only limited preparations (reconnaissance, minesweeping, rehearsals, staging) will be permitted or operational security will be jeopardized.

Conclusions Regarding Multinational Operations: The only multinational case studied was the Normandy invasion. It is important to note that this was an alliance with significant advantages: language, culture, and military doctrine were similar, and the alliance (at least the U.S.-Great Britain portion) had previously fought together. Furthermore, the operation was planned by a

combined joint staff and many rehearsals performed prior to execution. In a modern "pick-up" coalition, these factors are likely to be different, as evidenced by Desert Storm. Given the vast potential difficulties inherent in C²W when conducting combined operations, extreme caution seems prudent when attempting to synchronize coalition forces. Therefore the distinction between alliance and coalition will likely be meaningful in planning such operations. The conclusion is that in future combined operations, any amphibious landings should be conducted by one nation if possible. The U.S. could, for example, fulfill its obligation to the coalition as the enabling force. This seems much preferable than having all coalition nations share a sector of the landing zone, with all of the potential C²W problems involved.

Synchronization of littoral operations must take into account the timing of any subsequent land operations. Many times, as evidenced by Normandy, the amphibious landing is a critical phase but only an enabling operation as part of a large campaign. In such cases, factors favorable to the amphibious landing might be outweighed by considerations affecting the other phases of a campaign.

The factors of preparation and surprise are almost always conflicting. The overall commander must weight the factors and take into account the principles of war in making decisions. Another point worth making is that the selection of the landing site must take into account not only the initial assault, but the sustainment phase. Although LCACs have the capability to bring limited number of personnel and equipment ashore in approximately 80% of littoral areas, the sustainment requirements for a large operation, using amphibious ships, causeways, etc. are more strict.

Mines continue to present a formidable obstacle. Despite the technological progress made since Gallipoli, minesweeping is a time-consuming operation that involves putting virtually indefensible ships into an area exposed to shore battery fire, air strikes, surface ship action, and possibly subsurface threats. In addition, conducting minesweeping reduces surprise. With a relatively cheap, dumb mine, our most sophisticated platforms can be impeded. With time, mines can be detected and neutralized, but time is a critical resource when phasing littoral operations. Of all the threats in the littoral, mines pose the greatest obstacle with respect to synchronization.

Reconnaissance is one of the synchronization factors affected by technology. Satellite imagery, high altitude observation aircraft, new Special Operations Force capabilities, and other improvements in technology improve the amount of intelligence gathering possible without jeopardizing Operational Security. For example, the British SAS team on the Falklands utilized a portable satellite communications package that enabled it to communicate with the squadrons and Britain.²⁴

Another conclusion of the research is that Naval Gunfire Support (NGFS) is not a redundant, outmoded capability. It supplements air strikes, but cannot be replaced by air strikes. The utilization of NGFS was a major factor in Norway, Normandy and the Falklands despite the advent of air bombardments. As surface-to-air missiles continue to improve in accuracy and economy, NGFS will become a more valuable complement to strike aircraft. The synchronization planning must take into account both of these and deconflict them, possibly via the JFACC organization, since the JFACC is concerned with

the potential fratricidal problems.

FINAL REMARKS

Littoral operations, as evidenced by the case studies, present dilemmas to a commander: surprise vs. preparatory raids, recon, bombardments; dispersion vs. mass; dispersion vs. unity of command; critically timed events vs. simplicity, widespread knowledge of plan vs. OPSEC, and others. The commander must consider the effects of poor weather on friend and foe, and must consider amphibious landings in the context of subsequent land operations. He must tailor the operations to fit the disposition of the enemy, the weather, mines, etc. Time will undoubtedly be the critical factor in achieving a synergistic effect of coordinating joint forces, and thus the role of synchronization will evolve as an important element in operational art in the littoral.

NOTES

1. Naval War College Operations Supplement 3152, p. 6
2. Marder, *From the Dreadnought to Scapa Flow*, 2: 213-21 and Gretton, *Winston Churchill and the Royal Navy*, 214-15
3. Moorehead, Alan *Gallipoli* (Hamish Hamilton, 1956), p. 54.
4. IBID
5. IBID, p. 100.
6. IBID, p. 119.
7. Dardanelles Committee Final Report 9-10, 29.
8. Moorehead, p. 245.
9. U.S. Military Academy, West Point, *The Campaign in Norway, 1940* (West Point, N.Y., U.S. Military Academy Printing Office, July 1941), p. 4.
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